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         (FILE 'USPAT' ENTERED AT 14:27:28 ON 18 JUN 92)
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L2           0 S ((INTERNAL BUS) AND (TEST BUS))/TI,AB
L3           0 S (INTERNAL PATH) AND (TEST PATH)
L4          22 S (TEST PATH)/TI,AB
L5          17 S (TEST BUS)/TI,AB
L6           7 S (INTERNAL BUS) (P) (TEST BUS)
               E NINTENDO/IN
               E NINTENDO/ASN
L7          82 S E3
L8           0 S GLOVE AND L7
L9          34 S POWER AND L7
L10        231 S GLOVE#(10A)SENS?
L11         53 S GLOVE#(10A)SENSOR#
L12         10 S GLOVE#(10A)SENSOR#/CLM
L13          8 S GLOVE#(10A)SENSOR#/TI,AB
L14          7 S L12 NOT L13
L15         14 S 4414537/UREF
L16          0 S 4988981/UREF
L17          7 S 4524348/UREF
L18          4 S L17 NOT L15
L19          0 S 4862152/UREF
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L2   0 S ((INTERNAL BUS) AND (TEST BUS))/TI,AB
L3   0 S (INTERNAL PATH) AND (TEST PATH)
L4   22 S (TEST PATH)/TI,AB
L5   17 S (TEST BUS)/TI,AB
L6   7 S (INTERNAL BUS) (P) (TEST BUS)
                E NINTENDO/IN
                E NINTENDO/ASN
L7   82 S E3
L8   0 S GLOVE AND L7
L9   34 S POWER AND L7
L10   231 S GLOVE#(10A)SENS?
L11   53 S GLOVE#(10A)SENSOR#
L12   10 S GLOVE#(10A)SENSOR#/CLM
L13   8 S GLOVE#(10A)SENSOR#/TI,AB
L14   7 S L12 NOT L13
L15   14 S 4414537/UREF
L16   0 S 4988981/UREF
L17   7 S 4524348/UREF
L18   4 S L17 NOT L15

=> d 1-4 cit date ab

1. 5,111,005, May 5, 1992, Graphics tablet with N-dimensional capability;
Paul D. Smith, et al., 178/19; 340/710 [IMAGE AVAILABLE]

                                        L18: 1 of 4
TITLE: Graphics tablet with N-dimensional capability
US PAT NO: 5,111,005   DATE ISSUED: May 5, 1992
              [IMAGE AVAILABLE]
APPL-NO: 07/592,796   DATE FILED: Oct. 4, 1990

ABSTRACT:
A digitizer tablet and puck(cursor) for use therewith, characterized that in
one aspect the puck is provided with at least one additional control which
will provide the user with the ability to control at least one N-dimensional
signal in addition to the normal X-Y coordinate data. In accordance with
another aspect, any pointing device for the tablet is provided with the
capability to control the manner in which the N-dimensional signal varies in
response to user manipulation of the pointing device.

2. 5,059,959, Oct. 22, 1991, Cursor positioning method and apparatus; George
Barry, 340/709, 711 [IMAGE AVAILABLE]

                                        L18: 2 of 4
TITLE: Cursor positioning method and apparatus
US PAT NO: 5,059,959   DATE ISSUED: Oct. 22, 1991
              [IMAGE AVAILABLE]
APPL-NO: 06/740,641   DATE FILED: Jun. 3, 1985

ABSTRACT:

A cursor-aiming system for use with a screen having a movable cursor is
provided with means for generating a field and means for changing the
position of the cursor on the screen in response to the movement of an
operator's finger in the field. In one embodiment there is provided a
plurality of monostatic sonars and in another embodiment there is provided a
plurality of bistatic sonars. The sonars are mounted for the transmission and
reception of acoustic signals through apertures located in a spaced
relationship along the upper margin of a terminal keyboard. In typical
embodiments the signal frequency is approximately 200 KHz. Either pulsed or
continuous-wave signals may be employed. When pulses are used, a typical
pulse rate is 200 pps with a pulse width of 25 microseconds. Multiple
frequency systems comprise alternate pulses of 200 and 250 KHz. Interpulse
intervals are dithered to discriminate against around-the-timebase echoes.

3. 4,862,152, Aug. 29, 1989, Sonic positioning device; Ronald E. Milner,
340/712; 178/18; 367/104, 117, 907; 901/1 [IMAGE AVAILABLE]

		L18: 3 of 4
TITLE:	Sonic positioning device	
US PAT NO:	4,862,152	DATE ISSUED: Aug. 29, 1989
	[IMAGE AVAILABLE]	
APPL-NO:	06/694,765	DATE FILED: Jan. 25, 1985

ABSTRACT:
A three-dimensional ultrasonic position control device suitable for
controlling computer displays or robot movements is disclosed.
More specifically, signals from an ultrasonic transmitter are received by
multiple receivers. The received signals are processed by a processing
circuit which provides signals to a computer system for use in controlling a
computer display or a robot. This system is particularly adapted to use
inexpensive components to provide for a low cost mass producible control
device.

4. 4,746,914, May 24, 1988, Cathode ray tube for use in a touch panel
display system; Robert Adler, 340/712; 178/18; 333/153; 341/22

		L18: 4 of 4
TITLE:	Cathode ray tube for use in a touch panel display system	
US PAT NO:	4,746,914	DATE ISSUED: May 24, 1988
		DISCL-DATE: Oct. 13, 2004
APPL-NO:	06/741,975	DATE FILED: Jun. 6, 1985
REL-US-DATA:	Continuation-in-part of Ser. No. 698,306, Feb. 5, 1985, Pat.	
	No. 4,750,176.	

ABSTRACT:
A cathode ray tube for use in a touch panel system that is capable of
recognizing touch positions along a coordinate axis of a touch display
surface of the system has a flat glass faceplate capable of propegating
surface acoustic waves. An input surface wave transducer, acoustically
coupled to the touch display surface, serves to launch a burst of surface
waves on that surface. At least one array of wave reflective elements are
disposed in or on the touch display surface for directing the surface waves
derived from the input trasnducer across the touch display surface.

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        (FILE 'USPAT' ENTERED AT 14:27:28 ON 18 JUN 92)
                    SET PAGELENGTH 62
                    SET LINELENGTH 78
L1          13 S (INTERNAL BUS) AND (TEST BUS)
L2           0 S ((INTERNAL BUS) AND (TEST BUS))/TI,AB
L3           0 S (INTERNAL PATH) AND (TEST PATH)
L4          22 S (TEST PATH)/TI,AB
L5          17 S (TEST BUS)/TI,AB
L6           7 S (INTERNAL BUS) (P) (TEST BUS)
               E NINTENDO/IN
               E NINTENDO/ASN
L7          82 S E3
L8           0 S GLOVE AND L7
L9          34 S POWER AND L7
L10        231 S GLOVE#(10A)SENS?
L11         53 S GLOVE#(10A)SENSOR#
L12         10 S GLOVE#(10A)SENSOR#/CLM
L13          8 S GLOVE#(10A)SENSOR#/TI,AB
L14          7 S L12 NOT L13
L15         14 S 4414537/UREF
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=> d 1-14 cit date ab

1. 5,119,709, Jun. 9, 1992, Initial touch responsive musical tone control
device; Hideo Suzuki, et al., 84/600, 658, 687 [IMAGE AVAILABLE]

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                                        L15: 1 of 14
TITLE:          Initial touch responsive musical tone control device
US PAT NO:      5,119,709              DATE ISSUED:   Jun. 9, 1992
                [IMAGE AVAILABLE]
APPL-NO:        07/509,290            DATE FILED:    Apr. 13, 1990
FRN-PR. NO:     1-95656               FRN FILED:     Apr. 14, 1989
FRN-PR. CO:     Japan
FRN-PR. NO:     1-95657               FRN FILED:     Apr. 14, 1989
FRN-PR. CO:     Japan
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ABSTRACT:
A musical control device comprising a position detection device whereby the
position of a portion of a performer's body is detected and output as a
position signal, a velocity detection circuit whereby the velocity of the
portion of the performer's body is detected and output as velocity data based
on the change in the above mentioned position signal, and a musical control
signal output circuit whereby a musical control signal is generated and
output based on said position signal and velocity data.

2. 5,097,252, Mar. 17, 1992, Motion sensor which produces an asymmetrical
signal in response to symmetrical movement; Young L. Harvill, et al.,
340/540; 73/655; 200/DIG.2; 250/227.14, 227.16, 227.24, 227.28; 340/407, 600;
341/20, 31; 385/13 [IMAGE AVAILABLE]

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                                        L15: 2 of 14


                                        L15: 2 of 14
TITLE:          Motion sensor which produces an asymmetrical signal in
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response to symmetrical movement

US PAT NO: 5,097,252   DATE ISSUED: Mar. 17, 1992
                [IMAGE AVAILABLE]
APPL-NO: 07/427,970   DATE FILED: Oct. 26, 1989
REL-US-DATA: Continuation of Ser. No. 29,934, Mar. 24, 1987, abandoned.

ABSTRACT:
In one embodiment of the invention, a plurality of sensors are placed over
the joints of a hand. Each motion sensor comprises an optical fiber disposed
between a light source and a light sensor. An upper portion of the fiber is
treated so that transmission loss of light being communicated through the
optical fiber is increased only when the fiber bends in one direction. In
another embodiment of the invention, a flexible tube is disposed in close
proximity to a finger joint and bends in response to bending of the finger. A
light source and light sensor are provided on opposite ends of the tube for
continuously indicating the extent of bending of the tube. A wedge is
disposed between the tube and the finger for setting the tube straight when
the finger is hyperextended for eliminating the symmetry of the output signal
which ordinarily would result from bending of the tube on opposite sides of
the axis of movement. In a further embodiment of the invention, a light
source and light sensor are positioned in close proximity to a finger joint
so that bending of the finger toward the palm causes the source and sensor to
move away from each other. Bending the finger in the opposite direction
causes the source and sensor to move toward each other.

3. 5,047,952, Sep. 10, 1991, Communication system for deaf, deaf-blind, or
non-vocal individuals using instrumented glove; James P. Kramer, et al.,
395/2; 341/20; 381/36; 434/229 [IMAGE AVAILABLE]

                                          L15: 3 of 14
TITLE: Communication system for deaf, deaf-blind, or non-vocal
                individuals using instrumented glove
US PAT NO: 5,047,952   DATE ISSUED: Sep. 10, 1991
                [IMAGE AVAILABLE]
APPL-NO: 07/258,204   DATE FILED: Oct. 14, 1988

ABSTRACT:
A communication system for deaf, deaf-blind, or non-vocal individuals
includes an instrumented glove for obtaining electrical signals indicative of
a hand configuration of a first individual. Strain gage sensors in the glove
flex with movement of the hand. Each sensor includes a tension strain gage
and a compression strain gage which are serially connected and form two legs
in a bridge circuit. Signals from the bridge circuit are amplified and
digitized and applied to a computer which includes an adaptive pattern
recognition algorithm which is responsive to hand-state vectors for
recognizing letter beacons in hand-space. A second individual communicates
with the first individual through the computer system using a portable
keyboard. The output devices for communicating to the first and second
individuals depend on the visual, vocal and hearing capabilities of the
individuals and can be selected from a voice synthesizer, LCD monitor, or
braille display.

4. 5,005,460, Apr. 9, 1991, Musical tone control apparatus; Hideo Suzuki, et
al., 84/600, 615, 622, 644 [IMAGE AVAILABLE]

                                          L15: 4 of 14
TITLE: Musical tone control apparatus

US PAT NO: 5,005,460   DATE ISSUED: Apr. 9, 1991

                                           L15: 4 of 14

[IMAGE AVAILABLE]

APPL-NO:	07/289,181	DATE FILED:	Dec. 22, 1988
FRN-PR. NO:	62-328061	FRN FILED:	Dec. 24, 1987
FRN-PR. CO:	Japan		
FRN-PR. NO:	62-328062	FRN FILED:	Dec. 24, 1987
FRN-PR. CO:	Japan		
FRN-PR. NO:	62-328064	FRN FILED:	Dec. 24, 1987
FRN-PR. CO:	Japan		
FRN-PR. NO:	62-328065	FRN FILED:	Dec. 24, 1987
FRN-PR. CO:	Japan		
FRN-PR. NO:	62-328066	FRN FILED:	Dec. 24, 1987
FRN-PR. CO:	Japan		
FRN-PR. NO:	62-328067	FRN FILED:	Dec. 24, 1987
FRN-PR. CO:	Japan		
FRN-PR. NO:	62-328797	FRN FILED:	Dec. 25, 1987
FRN-PR. CO:	Japan		

ABSTRACT:
A musical tone control apparatus comprises a main unit and at least one
detector for detecting movement of player's finger, hand and the like. The
main unit can be mounted on a player's wrist by use of a belt. When plural
detectors are provided for detecting movements of player's fingers, tone
color, tone pitch of musical tone or key-on timing is controlled based on
combination of bent fingers. In order to detect bending of each finger, a
joint switch is provided for each finger. In order to prevent deviation of
key-on signals, a comparator is further used for comparing the predetermined
threshold value with detection value corresponding to the bending of each
finger so that the key-on signal is generated when the detection value
exceeds the threshold value.

5.   4,988,981, Jan. 29, 1991, Computer data entry and manipulation apparatus
and method; Thomas G. Zimmerman, et al., 340/706, 709 [IMAGE AVAILABLE]

                                           L15: 5 of 14

TITLE:	Computer data entry and manipulation apparatus and method
US PAT NO:	4,988,981 DATE ISSUED: Jan. 29, 1991

[IMAGE AVAILABLE]

APPL-NO:	07/317,107	DATE FILED:	Feb. 28, 1989
REL-US-DATA:	Continuation of Ser. No. 26,930, Mar. 17, 1987, abandoned.		

ABSTRACT:
Apparatus is disclosed for generating control signals for the manipulation of
virtual objects in a computer system according to the gestures and positions
of an operator's hand or other body part. The apparatus includes a glove worn
on the hand which includes sensors for detecting the gestures of the hand, as
well as hand position sensing means coupled to the glove and to the computer
system for detecting the position of the hand with respect to the system. The
computer system includes circuitry connected to receive the gesture signals
and the hand position signals for generating control signals in response
thereto. Typically, the control signals are used to manipulate a graphical
representation of the operator's hand which is displayed on a monitor coupled
to the computer system, and the graphical representations of the operator's
hand manipulates virtual objects or tools also displayed by the computer.

6.   4,937,444, Jun. 26, 1990, Optical flex sensor; Thomas G. Zimmerman,
250/231.1, 221; 341/31 [IMAGE AVAILABLE]

TITLE: Optical flex sensor
US PAT NO: 4,937,444   DATE ISSUED: Jun. 26, 1990
                [IMAGE AVAILABLE]
APPL-NO: 07/418,919   DATE FILED: Oct. 5, 1989
REL-US-DATA: Continuation of Ser. No. 218,426, Jul. 8, 1988, abandoned,
                which is a continuation of Ser. No. 892,888, Jul. 29, 1986,
                abandoned, which is a continuation of Ser. No. 745,035, Aug.
                1, 1985, abandoned, which is a division of Ser. No. 428,322,
                Sep. 29, 1982, Pat. No. 4,542,291, Sep. 17, 1985.

ABSTRACT:
An optical flex sensor is provided and consists of a flexible tube having two
ends, a reflective interior wall within the flexible tube and a light source
placed within one end of the flexible tube and a photosensitive detector
placed within the other end of the flexible tube to detect a combination of
direct light rays and reflected rays when the flexible tube is bent.

7.   4,905,001, Feb. 27, 1990, Hand-held finger movement actuated
communication devices and systems employing such devices; Henry C. Penner,
341/20; 340/407; 341/21; 434/114

TITLE: Hand-held finger movement actuated communication devices and
                systems employing such devices
US PAT NO: 4,905,001   DATE ISSUED: Feb. 27, 1990
APPL-NO: 07/105,597   DATE FILED: Oct. 8, 1987

ABSTRACT:
Disclosed are various forms of hand-held communication devices which serve as
alternatives to a keyboard and which, in addition, allow the user to receive
communications via the sense of touch. Although not so limited, the device is
well-adapted for use by persons who are speechless, deaf and speechless, or
even blind, deaf and speechless. The present invention provides particularly
compact and efficient finger movement actuated communication devices for
individually responding to thrust and push motions of at least one finger of
a person's hand. Thus, each finger can operate two switch elements, and the
four fingers of a person's hand can operate eight switch elements in
predetermined combinations suitable, for example, for communication in a
binary code. In a first disclosed embodiment, a handle-like body supports
eight switch actuators arranged as four pairs, with each of the pairs
corresponding to a particular finger. The two switch actuators are positioned
for selective activation by distal and proximal segments of a single finger.
In a second disclosed embodiment, four switch actuators are provided for
actuation by the fleshly portions of a person's fingertips. Each of the
switch actuators supports two distinct types of movement, pushing and
sliding, and corresponding operate a pair of switch elements. In a third
disclosed embodiment, collar-like rings are worn about the proximal and
middle segments of the user's hand. Relative motion between the collar-like
rings and a wrist harnass is sensed in order to respond to thrust and push

motions of the fingers.

8.   4,878,843, Nov. 7, 1989, Process and apparatus for conveying information
through motion sequences; Nina J. Kuch, 434/112; 352/39, 51 [IMAGE AVAILABLE]

                                                L15: 8 of 14
TITLE: Process and apparatus for conveying information through motion
                sequences
US PAT NO: 4,878,843   DATE ISSUED: Nov. 7, 1989
                [IMAGE AVAILABLE]

                                                L15: 8 of 14
APPL-NO: 07/203,818   DATE FILED: Jun. 8, 1988

ABSTRACT:
The disclosure provides a process and an apparatus for a system of animation
and a system of teaching finger spelling.

9.   4,849,732, Jul. 18, 1989, One hand key shell; Heinz C. Dolenc, 341/20;
200/5R; 341/23; 400/100, 486, 489 [IMAGE AVAILABLE]

                                                L15: 9 of 14
TITLE: One hand key shell
US PAT NO: 4,849,732   DATE ISSUED: Jul. 18, 1989
                [IMAGE AVAILABLE]
APPL-NO: 07/175,684   DATE FILED: Mar. 21, 1988
REL-US-DATA: Continuation of Ser. No. 769,012, Aug. 23, 1985, abandoned.

ABSTRACT:
A self-contained data terminal or typewriter keyboard completely operable by
a single human hand for the input of information into a computer or other
electronic device. The keyboard comprises five sets of keys, each set aligned
respectively with the thumb, index finger, middle finger, ring finger, and
small finger of an extended hand. Complementary orientation and positioning
of the sets are determined by whether the terminal is to be used by a
right-handed or left-handed user. The control keys may be used to manipulate
text or other information entered into the attached device and are operated
by the thumb. The character keys consist primarily of letters of the
alphabet, numbers, and punctuation sets and are positioned below the
remaining four fingers. The terminal is operated in a single keystroke
character input mode. Several data control keys can also be mounted to the
terminal to perform additional text manipulation functions, similar to the
control keys, or any other necessary commands. By using single keystroke
input keys according to the present invention, data input is faster and
easier than with conventional terminals because only one hand is necessary,
and there are fewer and less complex character input commands to memorize.

10.   4,829,174, May 9, 1989, Flexible tube optical intrusion detector; Thomas
L. Booth, et al., 250/221, 222.1

                                                L15: 10 of 14
TITLE: Flexible tube optical intrusion detector
US PAT NO: 4,829,174   DATE ISSUED: May 9, 1989
APPL-NO: 07/148,186   DATE FILED: Jan. 25, 1988
REL-US-DATA: Continuation of Ser. No. 912,260, Sep. 29, 1986, abandoned.

ABSTRACT:
A hollow flexible vinyl or other plastic tube having a shiny inner wall is
disposed along a boundary where intrusion detection is desired. A beam of
infrared radiation from an LED at one end of the tube is passed through the
tube by reflections from the wall to a detector at the other end. The
radiation is conducted along curved paths as well as straight paths. An
object intruding into the protected space with sufficient force to deform the
tube wall attenuates the radiation. A detection circuit senses the
attenuation and produces an intrusion signal. The detection circuit includes
logic which detects a failure in the radiation source or a light leak in the
tube.

11. 4,713,535, Dec. 15, 1987, Optical keyboard; Randy L. Rhoades, 250/221;
340/707, 825.19; 341/21, 27

                                                    L15: 11 of 14
TITLE: Optical keyboard
US PAT NO: 4,713,535   DATE ISSUED: Dec. 15, 1987
APPL-NO: 06/772,553   DATE FILED: Sep. 4, 1985

ABSTRACT:
An optical keyboard includes a plurality of photosensors arranged in an X-Y
coordinate system where a plurality of rows represent a plurality of X-axes
and a plurality of columns represent a plurality of Y-axes. Each sensor
represents input to data processing means. When a beam of light is cast onto
a photosensor, the photosensor is actuated to transmit a coded signal to a
microprocessor board. The microprocessor board scans the array of
photosensors row by row sequentially to identify the column position of an
actuated photosensor. The input received from the scanning operation is
converted to data and transmitted through either a serial or parallel
interface to a computer. Interface circuitry converts the data to a form
readable by the computer. Thus, by selectively moving a light source to
desired photosensors, specific information can be transmitted to a computer
for printout or for operation of other devices remotely controlled by the
computer to permit the computer to be operated by individuals unable to
perform manual keyboard operations.

12. 4,660,033, Apr. 21, 1987, Animation system for walk-around costumes;
Gordon C. Brandt, 340/825.72; 2/69; 200/5A, 502; 341/34; 446/299, 301 [IMAGE
AVAILABLE]

                                                    L15: 12 of 14
TITLE: Animation system for walk-around costumes
US PAT NO: 4,660,033   DATE ISSUED: Apr. 21, 1987
                [IMAGE AVAILABLE]
APPL-NO: 06/760,001   DATE FILED: Jul. 29, 1985

ABSTRACT:
A complete system for animating external features of a full size walk-around
costume designed for the entertainment industry is disclosed. The animation
system comprises two major parts: the costume itself and the
programming/playback system. The complete system is lightweight and portable
and gives complete freedom of motion to a person inside a walk-around
costume. The costume is made to simulate life by the inclusion of motors or
other devices which move the eyes, the eyelids, eyebrows, the ears, the nose,
and the mouth. The mouth movement is controlled by a radio signal which may
be synchronized with a prerecorded audio track. To give maximum spontaneity

to expression and to reduce the time required to program costume movements,
all other external features are controlled by the dancer inside the costume,
using newly developed pressure sensitive finger switches which are activated
by bending a finger.

13.   4,542,291, Sep. 17, 1985, Optical flex sensor; Thomas G. Zimmerman,
250/231.1, 551; 341/31

L15: 13 of 14

TITLE:	Optical flex sensor		
US PAT NO:	4,542,291	DATE ISSUED:	Sep. 17, 1985
APPL-NO:	06/428,322	DATE FILED:	Sep. 29, 1982

ABSTRACT:
An optical flex sensor is provided and consists of a flexible tube having two
ends, a reflective interior wall within the flexible tube and a light source
placed within one end of the flexible tube and a photosensitive detector
placed within the other end of the flexible tube to detect a combination of

L15: 13 of 14
direct light rays and reflected rays when the flexible tube is bent.

14.   4,524,348, Jun. 18, 1985, Control interface; Leonard R. Lefkowitz,
341/5; 178/18; 340/706, 724 [IMAGE AVAILABLE]

L15: 14 of 14

TITLE:	Control interface		
US PAT NO:	4,524,348	DATE ISSUED:	Jun. 18, 1985
	[IMAGE AVAILABLE]		
APPL-NO:	06/535,813	DATE FILED:	Sep. 26, 1983

ABSTRACT:
A control interface between a physical object, such as a part of the human
body, and a machine. Movement of the physical object in a defined field is
sensed, and signals corresponding to such movement are received, detected,
amplified and produced as an input signal to the machine to move an element
of the machine in the same direction as, and in an amount proportional to,
movement of the object. In one embodiment the machine is a video game system
and the element is a display signal.

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        (FILE 'USPAT' ENTERED AT 14:27:28 ON 18 JUN 92)
                    SET PAGELENGTH 62
                    SET LINELENGTH 78
L1          13 S (INTERNAL BUS) AND (TEST BUS)
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               E NINTENDO/IN
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L7          82 S E3
L8           0 S GLOVE AND L7
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L10        231 S GLOVE#(10A)SENS?
L11         53 S GLOVE#(10A)SENSOR#
L12         10 S GLOVE#(10A)SENSOR#/CLM
L13          8 S GLOVE#(10A)SENSOR#/TI,AB
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=> d 1-8 cit date ab

1. 5,047,952, Sep. 10, 1991, Communication system for deaf, deaf-blind, or
non-vocal individuals using instrumented glove; James P. Kramer, et al.,
395/2; 341/20; 381/36; 434/229 [IMAGE AVAILABLE]

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                                              L13: 1 of 8
TITLE:        Communication system for deaf, deaf-blind, or non-vocal
                 individuals using instrumented glove
US PAT NO:    5,047,952               DATE ISSUED:   Sep. 10, 1991
              [IMAGE AVAILABLE]
APPL-NO:      07/258,204              DATE FILED:    Oct. 14, 1988
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ABSTRACT:
A communication system for deaf, deaf-blind, or non-vocal individuals
includes an instrumented glove for obtaining electrical signals indicative of
a hand configuration of a first individual. Strain gage sensors in the
glove flex with movement of the hand. Each sensor includes a tension
strain gage and a compression strain gage which are serially connected and
form two legs in a bridge circuit. Signals from the bridge circuit are
amplified and digitized and applied to a computer which includes an adaptive
pattern recognition algorithm which is responsive to hand-state vectors for
recognizing letter beacons in hand-space. A second individual communicates
with the first individual through the computer system using a portable
keyboard. The output devices for communicating to the first and second
individuals depend on the visual, vocal and hearing capabilities of the
individuals and can be selected from a voice synthesizer, LCD monitor, or
braille display.

2. 4,988,981, Jan. 29, 1991, Computer data entry and manipulation apparatus
and method; Thomas G. Zimmerman, et al., 340/706, 709 [IMAGE AVAILABLE]

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                                              L13: 2 of 8
TITLE:        Computer data entry and manipulation apparatus and method
US PAT NO:    4,988,981               DATE ISSUED:   Jan. 29, 1991
              [IMAGE AVAILABLE]
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APPL-NO: 07/317,107   DATE FILED: Feb. 28, 1989
REL-US-DATA: Continuation of Ser. No. 26,930, Mar. 17, 1987, abandoned.

ABSTRACT:
Apparatus is disclosed for generating control signals for the manipulation of
virtual objects in a computer system according to the gestures and positions
of an operator's hand or other body part. The apparatus includes a glove
worn on the hand which includes sensors for detecting the gestures of the
hand, as well as hand position sensing means coupled to the glove and to the
computer system for detecting the position of the hand with respect to the
system. The computer system includes circuitry connected to receive the
gesture signals and the hand position signals for generating control signals
in response thereto. Typically, the control signals are used to manipulate a
graphical representation of the operator's hand which is displayed on a
monitor coupled to the computer system, and the graphical representations of
the operator's hand manipulates virtual objects or tools also displayed by
the computer.

3. 4,977,903, Dec. 18, 1990, Sensory transmitting membrane device; Bernard
M. Haines, 128/842, 844, 918 [IMAGE AVAILABLE]

TITLE: Sensory transmitting membrane device
US PAT NO: 4,977,903   DATE ISSUED: Dec. 18, 1990
                [IMAGE AVAILABLE]
APPL-NO: 07/509,258   DATE FILED: Apr. 13, 1990
REL-US-DATA: Continuation-in-part of Ser. No. 409,402, Sep. 19, 1989,
                    abandoned.

ABSTRACT:
A sensory transmitting membrane device having a flexible base material
including a plurality of solid or hollow projections integrally connected
thereto and extending from opposite sides of the membrane. The projections on
one side of the membrane are offset from the projections on the opposite side
of the membrane and are positioned so that an edge of the base of a
projection on one side of the membrane is in proximity to the opposite edge
of the base of a projection on the other side of the membrane, whereby a
linear motion of one projection in a direction parallel to the membrane
results in a similar motion by any cooperating projections, to thereby
enhance the transmission of tactile sensations from one side of the membrane
material to the other side. The sensory transmitting device is particularly
useful in latex or rubber surgical gloves, finger cots or condoms.

4. 4,586,387, May 6, 1986, Flight test aid; Garth A. Morgan, et al.,
73/862.05; 2/160; 73/862.58

TITLE: Flight test aid
US PAT NO: 4,586,387   DATE ISSUED: May 6, 1986
APPL-NO: 06/589,091   DATE FILED: Feb. 15, 1984
FRN-PR. NO: PF4452   FRN FILED: Jun. 16, 1982
FRN-PR. CO: Australia
PCT-NO: PCT/AU83/00078   PCT-FILED: Jun. 8, 1983
                                        371-DATE: Feb. 15, 1984

                                            102(E)-DATE: Feb. 15, 1984
PCT-PUB-NO: WO84/00064   PCT-PUB-DATE: Jan. 5, 1984

ABSTRACT:

 A flight test aid comprising means to measure force that is applied by a
pilot to the controls (7) of an aircraft to adjust the control surfaces while
manoeuvering the aircraft which utilizes a plurality of sensors (5-6)
supported in the interface between the control member (7) and the part of the
pilot (1) operating the control and means (9) to record the force from the
sensors (5-6) preferably through differencingmeans (21) to cancel pressure
applied equally to the sensors (5-6). A typical example is a glove (1)
with finger and palm sensors (5-6) connected to indicator means (9)
preferably through a differencer (21).

5. 4,580,569, Apr. 8, 1986, Apparatus and method for muscle stimulation;
Jerrold S. Petrofsky, 128/420A

                                                     L13: 5 of 8
TITLE: Apparatus and method for muscle stimulation
US PAT NO: 4,580,569   DATE ISSUED: Apr. 8, 1986
APPL-NO: 06/561,770   DATE FILED: Dec. 15, 1983

ABSTRACT:
A system for stimulating a grasping action by a paralyzed hand. The system
includes a sensor arrangement for detecting movement of a shoulder by the
paralyzed person. The sensor transmits shoulder movement signals to a
computerized controller which generates stimulation signals for stimulation
electrodes mounted within a cuff worn about the forearm which supports the
hand to be stimulated. Closed loop control is accomplished by use of a
glove to which are attached a length sensor and a pressure sensor
connected for alternative selection. Stimulation of deeply buried muscles is
accomplished by arranging the stimulation electrodes into side-by-side

                                                     L13: 5 of 8
electrode sets which are so positioned as to produce focusing of stimulation
energy at the location of the subject muscle.

6. 4,558,704, Dec. 17, 1985, Hand control system; Jerrold S. Petrofsky,
128/423R

                                                     L13: 6 of 8
TITLE: Hand control system
US PAT NO: 4,558,704   DATE ISSUED: Dec. 17, 1985
APPL-NO: 06/561,720   DATE FILED: Dec. 15, 1983

ABSTRACT:
A system for stimulating a grasping action by a paralyzed hand. The system
includes a sensor arrangement for detecting movement of a shoulder by the
paralyzed person. The sensor transmits shoulder movement signals to a
computerized controller which generates stimulation signals for stimulation
electrodes mounted within a cuff worn about the forearm which supports the
hand to be stimulated. Closed loop control is accomplished by use of a
glove to which are attached a length sensor and a pressure sensor
connected for alternative selection. Stimulation of deeply buried muscles is
accomplished by arranging the stimulation electrodes into side-by-side

electrode sets which are so positioned as to produce focusing of stimulation
energy at the location of the subject muscle.

7. 4,414,984, Nov. 15, 1983, Methods and apparatus for recording and or
reproducing tactile sensations; Alain Zarudiansky, 128/774; 414/5; 901/46

                                                    L13: 7 of 8
TITLE: Methods and apparatus for recording and or reproducing tactile
                sensations
US PAT NO: 4,414,984   DATE ISSUED: Nov. 15, 1983
APPL-NO: 05/969,295   DATE FILED: Dec. 14, 1978
FRN-PR. NO: 77 38181   FRN FILED: Dec. 19, 1977
FRN-PR. CO: France

ABSTRACT:
Apparatus for recording tactile sensations comprises a sensing or "receptor"
glove used to effect a tactile exploration of an object whose "feel" is to be
recorded. The glove typically includes a mosaic of pressure and temperature
sensors in an "artificial skin", which is applied to the object during the
tactile exploration, and is connected to further sensors for sensing the
motivity parameters of the movable parts, e.g. fingers and wrist, during the
exploration. The pressure and temperature sensors are preferably formed by
localized diffusions of electrically conductive material into a sheet of a
flexible insulating material. The electrical signals produced by the sensors
are recorded, and are then used, with or without further processing, to
operate apparatus for reproducing tactile sensations. This latter apparatus
can comprise a motor glove for reproducing the motivity parameters, and/or a
flexible membrane containing a mosaic of piston members and electrical
heating elements for reproducing pressure and temperature sensations
respectively.

8. 4,414,537, Nov. 8, 1983, Digital data entry glove interface device; Gary
J. Grimes, 341/20; 400/475, 479.2, 489; 434/112, 229

                                                    L13: 8 of 8
TITLE: Digital data entry glove interface device
US PAT NO: 4,414,537   DATE ISSUED: Nov. 8, 1983
APPL-NO: 06/302,700   DATE FILED: Sep. 15, 1981

                                                    L13: 8 of 8

ABSTRACT:
A man-machine interface is disclosed for translating discrete hand positions
into electrical signals representing alpha-numeric characters. The interface
comprises a glove having sensors positioned with respect to the hand for
detecting the flex of finger joints and sensors for detecting the contact
between various portions of the hand. Additional sensors detect the movement
of the hand with respect to a gravitational vector and a horizontal plane of
reference. Further additional sensors detect the twisting and flexing of the
wrist. The additional sensors are associated with prescribed mode signals
which determine whether subsequently formed or priorly formed character
specifying hand positions are to be entered for transmission. The
alpha-numeric characters associated with the formed character specifying hand
positions are transmitted only when the appropriate mode signal results. The
forming and moving of the hand actuates various combinations of sensors so
that electrical signals representing the specified characters are generated

and transmitted.

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| US PAT NO: | 4,988,981 [IMAGE AVAILABLE] | L13: 2 of 8 |

US PAT NO: 4,988,981 [IMAGE AVAILABLE]   L13: 2 of 8
DATE ISSUED: Jan. 29, 1991
TITLE: Computer data entry and manipulation apparatus and method
INVENTOR: Thomas G. Zimmerman, San Francisco, CA
                  Jaron Z. Lanier, Palo Alto, CA
ASSIGNEE: VPL Research, Inc., Redwood City, CA (U.S. corp.)
APPL-NO: 07/317,107
DATE FILED: Feb. 28, 1989

REL-US-DATA: Continuation of Ser. No. 26,930, Mar. 17, 1987, abandoned.
INT-CL: [5] G09G 3/02
US-CL-ISSUED: 340/709, 709, 725
US-CL-CURRENT: 340/706, 709
SEARCH-FLD: 340/709, 706, 712, 705, 725, 6; 352/50
REF-CITED:

U.S. PATENT DOCUMENTS

1,335,272	3/1920	Broughton	
2,356,267	8/1944	Pelunis	
3,510,210	5/1970	Haney	352/50
3,777,086	12/1973	Riedo	
4,059,830	11/1977	Threadgill	
4,074,444	2/1978	Laenger et al.	340/365R
4,209,255	6/1980	Heynau et al.	340/707
4,302,138	11/1981	Zarudiansky	
4,355,805	10/1982	Baer et al.	340/709
4,408,495	10/1983	Couch et al.	
4,414,537	11/1983	Grimes	340/365S
4,414,984	11/1983	Zarudiansky	
4,524,348	6/1985	Lefkowitz	340/365R
4,540,176	9/1985	Baer	
4,542,291	9/1985	Zimmerman	
4,544,988	10/1985	Hochstein	
4,553,393	11/1985	Ruoff	
4,558,704	12/1985	Petrofsky	
4,565,999	1/1986	King et al.	340/707
4,569,599	2/1986	Bolkow et al.	356/5
4,579,006	4/1986	Hosoda	
4,581,491	4/1986	Boothroyd	
4,586,335	5/1986	Hosoda et al.	
4,586,387	5/1986	Morgan et al.	
4,613,139	9/1986	Robinson, II	
4,634,856	1/1987	Kirkham	
4,654,520	3/1987	Griffiths	
4,654,648	3/1987	Herrington et al.	340/706
4,660,033	4/1987	Brandt	
4,665,388	5/1987	Ivie et al.	
4,682,159	7/1987	Davison	340/709
4,711,543	12/1987	Blair et al.	352/50
4,715,235	12/1987	Fukui et al.	

FOREIGN PATENT DOCUMENTS
```
3442549   11/1984  Federal Republic of Germany
3334395    4/1985  Federal Republic of Germany
1225525    4/1986  Soviet Union
```

OTHER PUBLICATIONS
Fisher et al., "Virtual Environment Display System", ACM 1986 Workshop on
   Interactive 3D Graphics, Oct. 23-24, 1986, Chapel Hill, N.C.

US PAT NO: 4,988,981 [IMAGE AVAILABLE]   L13: 2 of 8
DATE ISSUED: Jan. 29, 1991
TITLE: Computer data entry and manipulation apparatus and method
The Human Interface in Three Dimensional Computer Art Space by Jennifer A.
   Hall, B.F.A., Kansas City Art Institute 1980.
Human Body Motion As Input to an Animated Graphical Display by Carol Marsha
   Ginsberg, B.S., Massachusetts Institute of Technology, 1981.
Put-That-There: Voice and Gesture at the Graphics Interface by Richard A.
   Bolt, Massachusetts Institute of Technology, 1980.
Proceedings, SPIE Conference on Processing and Display of Three-Dimensional
   Data-Interactive Three-Dimensional Computer Space-by Christopher Schmandt,
   Massachusetts Institute of Technology, 1982.
"One-Point Touch Input of Vector Information for Computer Displays", C. Herot
   and G. Weinzapfel, Computer Graphics, vol. 12, No. 3, Aug. 1978.
"Digital Actuator Utilizing Shape Memory Effect", Honma, et al. lecture given
   at 30th Anniversary of TOKAI Branch foundation on Jul. 14, 1981.
"Micro Manipulators Applied Shape Memory Effect", Honma et al., paper
   presented at 1982 Precision Machinery Assoc. Autumn Conference of Oct. 20.
   (Also in Japanese).
"Magnetoelastic Force Feedback Sensors for Robots and Machine Tools", John M.
   Vranish, National Bureau of Standards, Code 738.03.
"Analysis of Muscle Open and Closed Loop Recruitment Forces: Preview to
   Synthetic Proprioception", Solomonow, et al., IEE Frontier of Engineering
   and Computing in Health Care, 1984.
"Shape Memory Effect Alloys for Robotic Devices", Schetky, L. Robotics Age,
   Jul. 1984, pp. 13-17.
"Laboratory Profile", R & D Frontiers.
"Hitachi's Robot Hand", Robotics Age, Jul. 1984.
ART-UNIT: 269
PRIM-EXMR: Alvin E. Oberley
LEGAL-REP: Townsend and Townsend

ABSTRACT:
Apparatus is disclosed for generating control signals for the manipulation of
virtual objects in a computer system according to the gestures and positions
of an operator's hand or other body part. The apparatus includes a glove
worn on the hand which includes sensors for detecting the gestures of the
hand, as well as hand position sensing means coupled to the glove and to the
computer system for detecting the position of the hand with respect to the
system. The computer system includes circuitry connected to receive the
gesture signals and the hand position signals for generating control signals
in response thereto. Typically, the control signals are used to manipulate a
graphical representation of the operator's hand which is displayed on a
monitor coupled to the computer system, and the graphical representations of
the operator's hand manipulates virtual objects or tools also displayed by

the computer.

66 Claims, 6 Drawing Figures

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        (FILE 'USPAT' ENTERED AT 14:27:28 ON 18 JUN 92)
                    SET PAGELENGTH 62
                    SET LINELENGTH 78
L1           13 S (INTERNAL BUS) AND (TEST BUS)
L2            0 S ((INTERNAL BUS) AND (TEST BUS))/TI,AB
L3            0 S (INTERNAL PATH) AND (TEST PATH)
L4           22 S (TEST PATH)/TI,AB
L5           17 S (TEST BUS)/TI,AB
L6            7 S (INTERNAL BUS) (P) (TEST BUS)
                E NINTENDO/IN
                E NINTENDO/ASN
L7           82 S E3
L8            0 S GLOVE AND L7
L9           34 S POWER AND L7
L10         231 S GLOVE#(10A)SENS?
L11          53 S GLOVE#(10A)SENSOR#
L12          10 S GLOVE#(10A)SENSOR#/CLM
L13           8 S GLOVE#(10A)SENSOR#/TI,AB
L14           7 S L12 NOT L13
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=> d 1-7

1. 5,062,855, Nov. 5, 1991, Artifical limb with movement controlled by
reversing electromagnet polarity; Richard G. Rincoe, 623/24; 294/65.5, 88;
414/1; 623/64; 901/36, 40 [IMAGE AVAILABLE]

2. 5,024,136, Jun. 18, 1991, Equipment for gun loader; Erich Bock, 89/6, 6.5
[IMAGE AVAILABLE]

3. 4,889,266, Dec. 26, 1989, Apparatus for donning sterile gloves and
sterile glove package for use therewith; Patrick W. Wight, 223/111; 206/278

4. 4,882,787, Nov. 28, 1989, Golf glove; Harold L. Hull, et al., 2/161A, 163

5. 4,870,868, Oct. 3, 1989, Vibration sensing apparatus; Raymond F. Gastgeb,
et al., 73/649; 273/29A [IMAGE AVAILABLE]

6. 4,866,433, Sep. 12, 1989, Vehicle locking and unlocking system; Shoji
Akutsu, 340/825.31; 307/10.2; 340/825.69 [IMAGE AVAILABLE]

7. 3,817,102, Jun. 18, 1974, COMBINED TEMPERATURE-HUMIDITY INDEX COMPUTATION
KIT; Gerald A. Shea, 73/338; 235/70R; 374/109 [IMAGE AVAILABLE]

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